



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

Bentley, J. M. The cotton boll weevil in Tennessee.

(1917)

HARVARD UNIVERSITY.



LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOOLOGY

51184

GIFT OF

*Tennessee state board
of entomology.*

January 14, 1919.

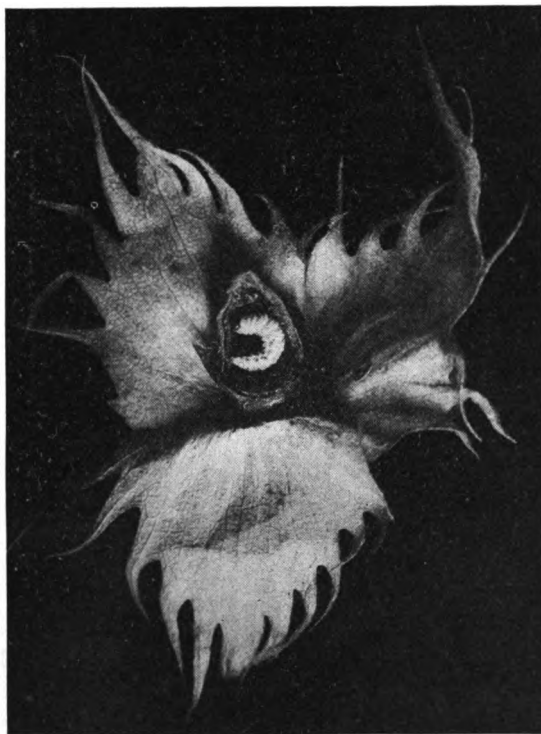
JAN 14 1919

51.184

**TENNESSEE
STATE BOARD OF ENTOMOLOGY**

BULLETIN No. 22

Vol. VI. No. 3



Full Grown Larva In Cotton Square

The Cotton Boll Weevil In Tennessee

By **G. M. BENTLEY**

KNOXVILLE, TENNESSEE

SEPTEMBER, 1917

57



TENNESSEE STATE BOARD OF ENTOMOLOGY

H. K. BRYSON, Commissioner of Agriculture-----Chairman
Nashville

G. M. BENTLEY, State Entomologist and Plant Pathologist----Sec'y.
Knoxville

All communications should be addressed to the

STATE ENTOMOLOGIST AND PLANT PATHOLOGIST,
Care of University of Tennessee,
Knoxville, Tennessee.

ASSISTANT NURSERY INSPECTORS

J. E. Blake

A. B. King

TENNESSEE STATE BOARD OF ENTOMOLOGY

Bulletin published quarterly at Knoxville

G. M. Bentley, State Entomologist and Plant Pathologist

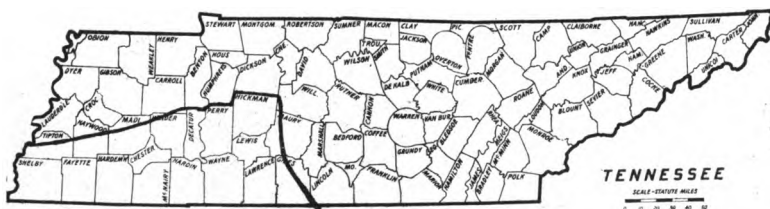
Entered as second-class matter, February 21, 1912, at the Post Office at Knoxville,
Tennessee, under the Act of July 16, 1894

THE COTTON BOLL WEEVIL IN TENNESSEE

BY G. M. BENTLEY

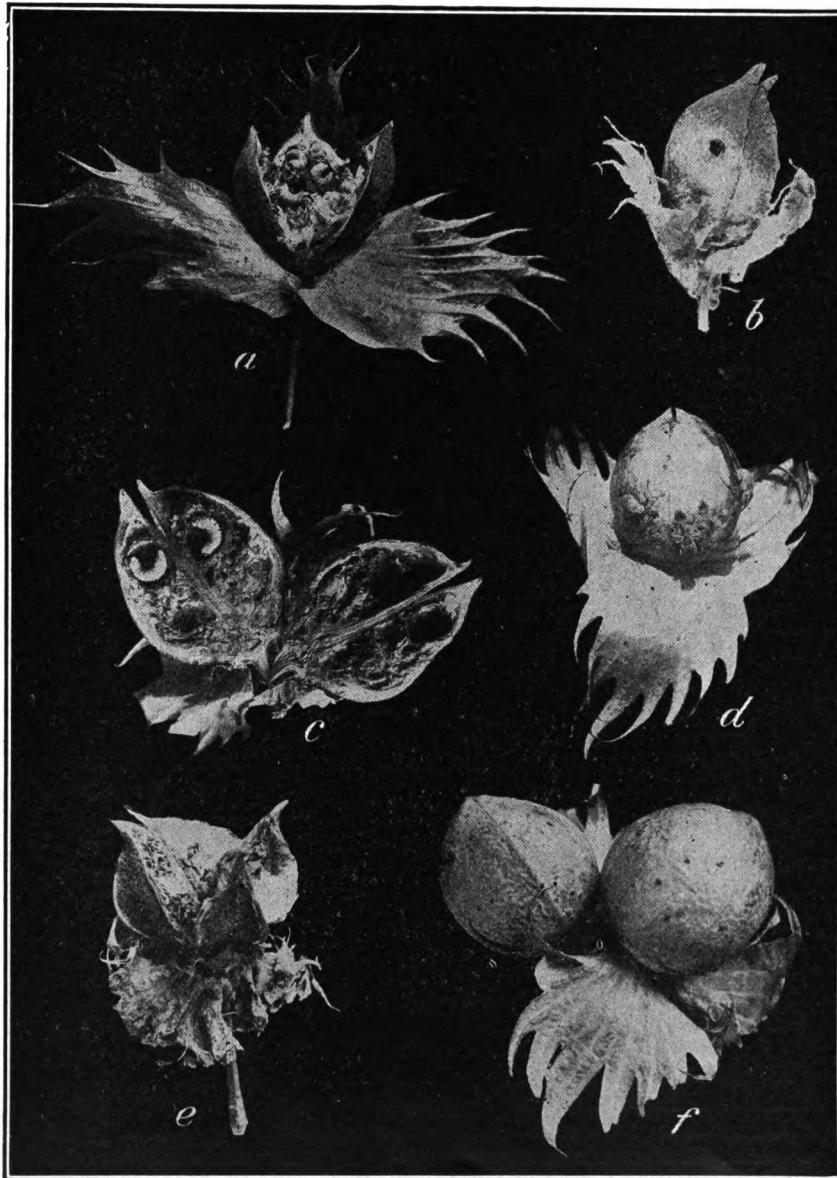
GENERAL INFORMATION

In the past 24 years the Mexican cotton boll weevil has developed from a rather obscure species to one of supreme importance with respect to the production of the world's supply of cotton. From southern Texas the weevil has advanced northward and eastward at an average rate of 50 miles a year, until in 1914 it crossed over into Tennessee, and at present occurs in all or part of 19 counties in the southwestern part of the State. The advance of the weevil in 1915 covered more new



Showing Advance of Cotton Boll Weevil. November, 1917, Weevils Were Found in Counties Below Heavy Dark Line

area than in any season since it entered Texas in 1892. The 1915 migration of the weevil covered some 140 miles in an eastwardly and northeastwardly direction. An explanation for this unusual spread is found in the occurrence of a strong wind coincident to the annual flight of the boll weevil during the latter part of August. Following the severe storm at Galveston, Texas, this heavy west and southwest wind is supposed to have carried the flying weevils long distances beyond where they would have normally settled. In the fall of the same year, 1915, the cotton boll weevil was found in limited numbers in Shelby, Fayette, Hardeman, Hardin, McNairy and Wayne counties of this State. The severity of the winter of 1915-16 was not sufficient to kill the new invader, and during the year 1916 active weevils have been taken in most of the counties given above; also in Tipton County just north of Shelby. No serious weevil injury this season has been located in any of the counties mentioned, but we must face the fact that the boll weevil has shown a wonderful ability to adapt itself to colder climate conditions as it has spread gradually northward from Mexico.



Weevil Infested Bolls, Showing Egg and Feeding Punctures and Young Weevils
(U. S. Bu. of Ent.)

It is plain, therefore, to see how by adaptation the weevil may withstand the Tennessee winter.

To direct attention to the present status of the boll weevil situation in Tennessee for the purpose of taking precautions and to familiarize cotton growers and county agricultural agents with the habits of the weevil and methods of control, is the purpose of this bulletin.

PROGRESS OF INFESTATION

Mexico is given as the home of the boll weevil, and how long it has been there no one knows. Not until the weevil flew over the Rio Grande River and settled down in Texas in 1892, was any special attention directed to it. In less than two years it scattered into some half dozen counties in Texas. It was then made a subject of special investigation by the U. S. Division of Entomology, and Congress appropriated \$250,000 for this research. Later, special appropriations were made by certain of the states. Working together, federal and state authorities have developed many facts concerning the weevil's habits and life history which are essential in adopting practical methods of control. The progress of infestation has been rapid, and it now appears that the cotton growing area of the United States will alone limit the spread of the weevil. The cotton regions of Texas, Louisiana, Oklahoma, Mississippi, Arkansas, Alabama, Georgia and Florida, have suffered heavy losses, and it remains to be seen how the weevil's presence will affect Tennessee.

Migration Any time from the middle of August to the middle of November, each year, the weevil takes wing and flies over long distances, doubtless seeking new feeding ground. If they are fortunate enough to find uninfested cotton squares or bolls, they feed on them and the female weevils will soon begin to lay eggs. It is a matter of 3 or 4 weeks when a new generation of the weevil appears. If frost has not destroyed the late cotton by this time, another laying and a second generation may appear.

These late hatched weevils best withstand the winter, and many of the old weevils, weakened by the long flight or by the laying of eggs, die at the approach of cold weather.

The eastward spread of the weevil promises to be as certain and as rapid as it was northward, and eventually the weevil will infest cotton fields wherever cotton is grown commercially in the Southwestern States.

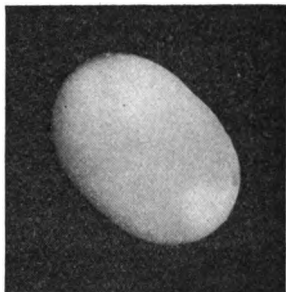
HABITS OF THE WEEVIL

A knowledge of the life and habits of the weevil is essential in order to take up effective methods of its control. It is now known that the cotton plant furnishes the weevil all its food. It passes the winter

usually as an adult in cotton and weed stalks, old cotton bolls, bunches of grass, beneath leaves, in Spanish moss, beneath the bark of dead trees, in old stumps, in fence rows, in cotton seed in out-buildings, and beneath trash of all kinds when they occur near the cotton fields in which the late generations appear. Of the economic insects, the weevil is the most resistant to parasites of all kinds.

Spring activities From their hibernation places the weevils come forth in the spring very irregularly from early spring, as soon as the weather begins to warm, until July. They feed first on the young cotton stems.

Egg



Egg of Cotton Boll Weevil
(U. S. Bu. of Ent., Bul. 51)

The egg is laid in either a cotton square or a boll. An egg puncture is made to the inside of them by the female weevil eating a small channel; in this the small, elliptical, pearly white egg is placed and pushed down. The egg puncture can be distinguished from a feeding puncture by its being sealed and by a waxy wart-like accumulation over it. The feeding puncture is always unsealed. In most cases but one egg is placed in a square, and as many as 200 eggs may be laid by one weevil during a season. The time of hatching will depend upon the weather, and varies from 2 to 15 days.

Larva



Side View of Larva
(U. S. Bu. of Ent., Bul. 51)

The larva is a white, footless grub, at first about 1-25 of an inch long. All of its life is spent in the square or boll. Its food consists either of the floral parts or the young developing cotton. It molts 2 or 3 times, and when ready to pupate it encloses itself in a ball of castings and lint. While in the boll the larva can withstand a heavy frost, and may afterward complete its life cycle. In a square it takes from 6 to 7 days to complete its larval growth, while in a cotton boll it requires as many as 6 to 7 weeks.

Pupa

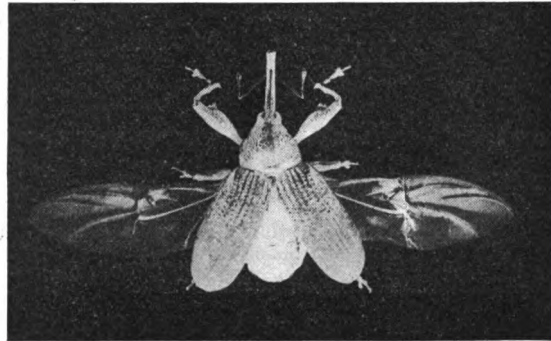
In the resting or pupa stage, the weevil remains 3 or 4 days in warm weather, but in cool weather they have been known to require as many as 15 days.



Ventral View of Pupa
(U. S. Bu. of Ent., Bul. 51)

Adult

When first emerged, the adult is soft and unable to walk, but in 2 or 3 days it chews a channel through the square or boll and crawls out to lead a free, active life. They vary greatly both in size and color owing to the food supply. An average size is $\frac{1}{4}$ inch. Small adults

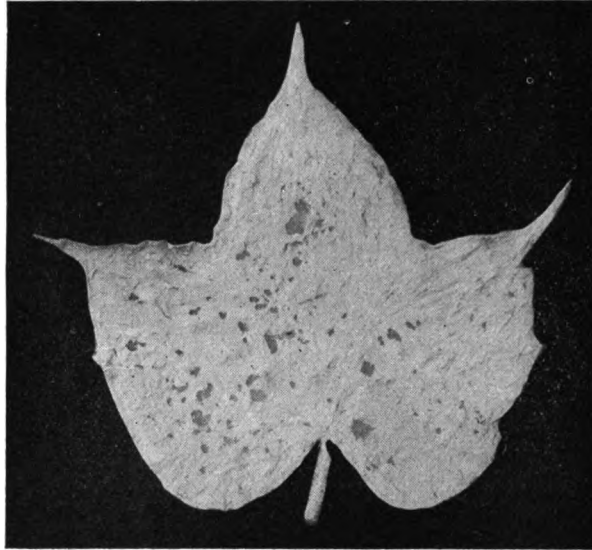


Adult Cotton Boll Weevil, Wings Spread x 4 Diam.
(U. S. Bu. of Ent., Bul. 51)

are of dark brown, and large adults are light yellowish brown. The average color is a grayish brown.

Number of generations In the northern part of the weevil territory, of which Tennessee may be considered, where the season is shorter and the prevailing temperature lower, there are four generations a year. For one generation an average of 42 days is required. The number of weevils resulting from a pair of weevils in a single season has been estimated at 134,000,000.

Feeding habits The squares of cotton are first sought, and then the leaves and bolls make up the food of the weevil. The beak is used to chew and to puncture the square or boll that the contents may be obtained. It is stated that an average of three punctures are made each day. When the female



Leaf Fed On Extensively by Weevils in Confinement
(U. S. Bu. of Ent., Bul. 51)

begins to lay she eats slower, usually making one puncture a day, and in this an egg is placed.

LOSS RESULTING FROM THE WEEVIL

The weevil infestation in Tennessee is slight as yet, and little, if any, injury has been felt, but in the light of experience from the effect of the weevil in other states, after a second or third year in a territory we are sure to suffer heavy loss unless rigid measures of control are adapted and generally practised throughout the cotton area of the State. In 1916 Tennessee had 5,700 square miles, and in 1917 a gain of 3,400 square miles infested with the weevil according to W. D. Hunter, U. S. Department of Agriculture, Bureau of Entomology.

The Texas cotton crop, after the weevil had been in the state nine years, was reduced 739,360 bales; and this loss in that year amounted to \$49,272,989. The annual loss in Texas, over a series of years, is from \$15,000,000 to \$50,000,000, or a loss of fully one-half of the crop.

In an area in Alabama which produced an average of 15,000 bales of cotton annually before weevil infestation, produced only 2,000 bales after the weevil was present.

In cotton-growing sections where measures of control have not been adopted, almost total losses have resulted. The presence of the weevil has also meant much in depreciating the value of land, and affecting immigration.

METHODS OF CONTROL

Starvation

The natural migration of the weevil is beyond the control of man to check. A rigid quarantine of cotton seed and other articles from infested areas may delay earlier infestations. Preliminary steps in the cropping systems and in the culture of cotton, in the face of the fact that the weevil is to be a factor in agricultural economics, is both timely and important.

With the weevil already present, the methods given below sum up the most approved means of control based on a study of the weevil's life history, and the results of many field experiments conducted by the U. S. Bureau of Entomology.

Starvation of late broods by doing away with the "top crop" or the cotton which develops from late maturing bolls. It has been proven conclusively that after the main picking, the stalks should be broken down and plowed under. The late developing squares and bolls feed the last generations of the weevil, and it is these weevils which develop and pass the winter in best condition. The old stalks are a menace, for they also furnish a wintering place for the adult weevils. The starvation of late broods is the most effective method known to reduce the number of weevils.

The custom of getting the seed at the gin should be discouraged. It is far better to select seed from the earliest maturing cotton in the field. If cotton is picked by October 1st, and the stalks destroyed, large numbers of the late broods would be starved out. Trice cotton is one of the best standards in weevil control for Tennessee.

Cultural methods

Pushing the crop to maturity to get ahead of the weevil must be stressed. To this end a smaller acreage which could be better fertilized and cultivated is recommended.

Arsenicals

Since the growing weevils do most of their eating within the squares and bolls, the use of arsenate of lead or Paris green has been considered of small value, but it has been found that the developing weevil comes from the boll at times to get more liquid by sipping the rain or poisoned dew adhering to the plant, hence the dust application of arsenate of lead is proving efficacious.

CONCLUSION

Cognizance of our pending danger must be taken and steps pursued to put into active operation the recommendations of agricultural practice imperative to success in handling the boll weevil situation. The problem is a grave one which demands the united efforts of those following commercial, professional and agricultural life. The campaign must be co-operative that we may be prepared to best meet and to most effectively overcome the cotton boll weevil in Tennessee.



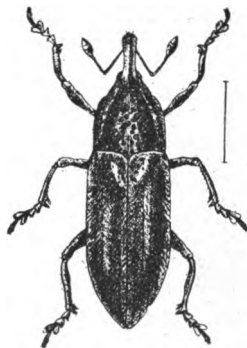
Cotton Plant Attacked by Weevils
(U. S. Bu. of Ent.)

**THE TRUE COTTON BOLL WEEVIL AND OTHER INSECTS
OFTEN TAKEN TO BE THE WEEVIL**

**Notice the Bi-forked Tooth on Femur, Markings of Wing Covers,
Location and Form of Antennae of Boll Weevil In
Comparison with the Others**



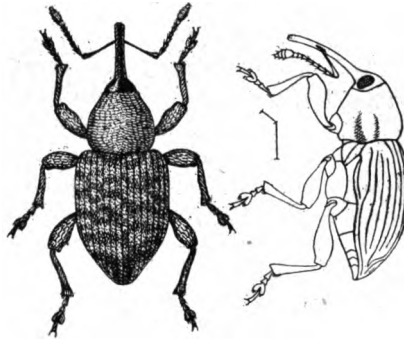
**Cotton Boll Weevil (*Anthonomus grandis*), About 5 Times Natural Size
Back and Side Views
(Farmers Bul. 848, U. S. Dep. Agr.)**



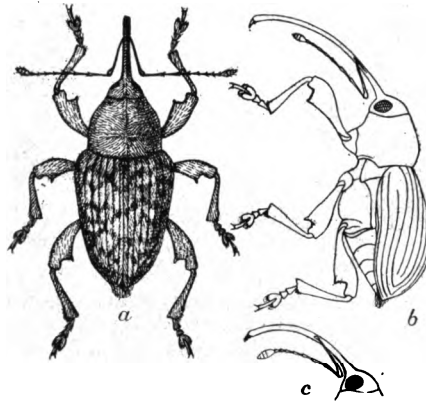
***Lixus* sp., x 3½**



***Chalcedermis aeneus* (Enlarged)**

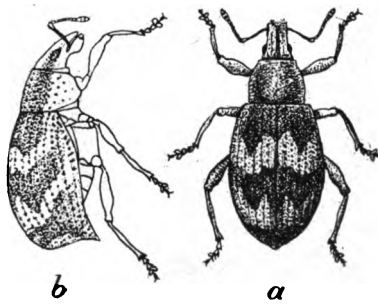


Desmoris Scapalis (Enlarged)



Acorn Weevil

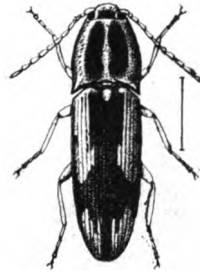
(a, Female, Dorsal View; b, Same, Lateral View; c, Head, Snout and Antennae of Male)



Imbricated Snout Beetle (Enlarged)



Chalcodermus aenus (Enlarged)



Snapping Beetle (Enlarged)



Pepper Weevil (Much Enlarged)



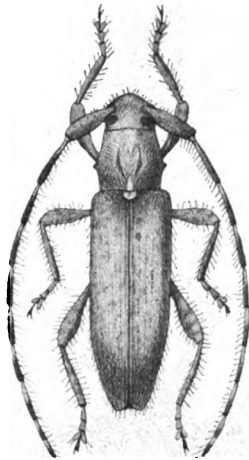
Apple Curculio (Enlarged)
(U. S. Bu. Ent., Bul. 51)



Sharpshooter (Enlarged)
(U. S. Bu. Ent., Bul. 51)



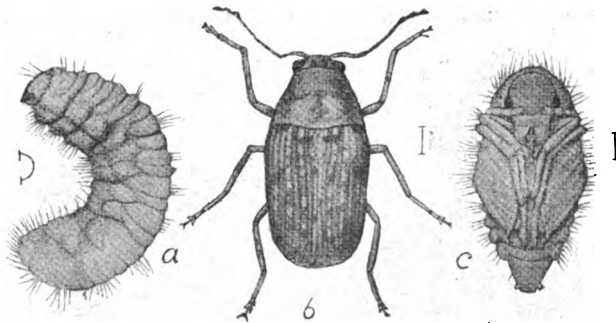
Sharpshooter (Enlarged)



Cotton Stalk Borer (Enlarged)
(Howard)



Cotton Stainer (Enlarged)
(U. S. Bu. Ent., Bul. 51)



Coffee Bean Weevil

Gaylord Bros.
Makers
Syracuse, N. Y.
PAT. JAN. 21, 1908



3 2044 107 174 161

